Creator of the world's first radio and radio transmitter

ALEXANDER STEPANOVICH POPOV

RECEIVER DEVICE

He was not satisfied with the Hertz method, in which the indicator of oscillations was a small spark viewed in a magnifying glass; he was looking for a new, practical and sensitive oscillation detector. So he designed a special mechanical radiometer, an air thermometer, but all these indicators did not satisfy Popov very much. Undoubtedly, at this time he was thinking about the practical application of the will of Hertz. Therefore, he took with special acuteness everything new in the field of detecting electric oscillations.

In 1890, the French physicist Eduard Branly reported on the effect of an electric discharge on the conductivity of metal powders (iron, aluminum, antimony, cadmium, zinc, bismuth, etc.) that he observed. Branly wrote: *If you make a circuit consisting of an element of Daniel, a sensitive galvanometer, a metal conductor and an ebonite plate coated with copper or a tube with sawdust, then for the most part only an insignificant current passes. However, the resistance decreases sharply, as can be seen from the strong deviation of the galvanometer if one or more discharges are made near the circuit.* // M. A. Chatelin, Russian Electrical Engineering, p. 291.//

In 1894 Branly described this phenomenon in more detail in the article "On the conductivity of non-continuous conductive substances". However, neither the first nor the second message emphasizes or even indicates the role of electric oscillatory processes in changing conductivity, and the question of using this phenomenon as an indicator of oscillations is not even raised.

As an indicator of vibrations, a tube with sawdust was used by O. Lodge in 1894 and named it "coherer". "This device, which I call the coherer, is surprisingly sensitive as a hertz wave detector," wrote Lodge. Lodge's message made a huge impression on Popov. His colleague P.N. Rybkin wrote on this subject: *I still remember with what excitement A.S. showed me the number of the journal, in which Lodge's article was posted, where he described his famous experiments on the application of Branly's discovery to the coherer's device for detecting with his electric vibrations*.

It is easy to reverse both the excitement and further creative searches of Popov: a way has been outlined for solving a big problem. By the spring of 1895, the world's first receiver of electrical vibrations was created. On April 25 (May 7), 1895, at the 151st (201st) meeting of the Physical Department of the Russian Physicochemical Society, A. S. Popov made a report “On the relation of metal powders to electric vibrations”. The content of the report, supplemented by test reports on the registration of atmospheric discharges made by G. A. Lobachevsky with the Popov instrument at the Forestry Institute in the summer of 1895, was the subject of Popov's article “An apparatus for detecting and recording electric oscillations A, S. Popov”, presented in December 1895 in the journal of the Russian Physicochemical Society and appeared in the first issue of this journal in 1896.

The tube with sawdust is suspended horizontally between the clamps M and N on a light clock spring, which for greater elasticity is bent by one zigzag clamp. A bell is located above the tube so that in its action it can give light blows with a hammer in the middle of the tube, protected from breaking by a rubber ring. It is most convenient to strengthen the handset and bell on a common vertical plank. The relay can be placed at will.

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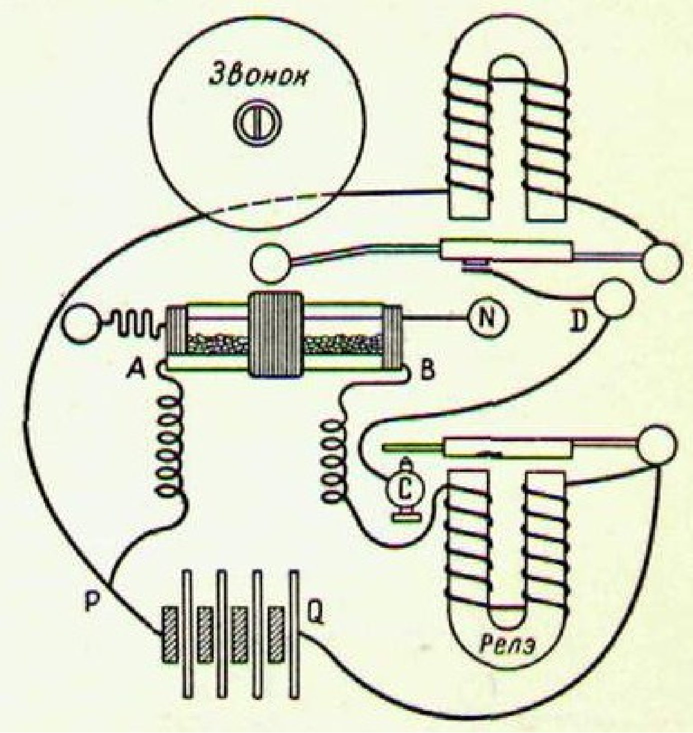
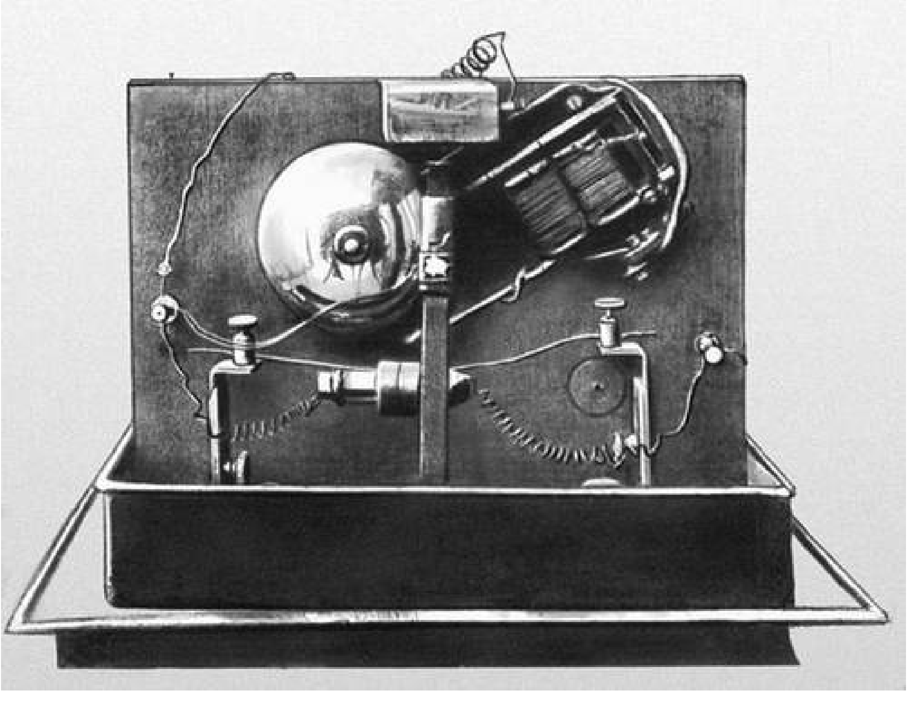
Website
Creator Radio-A.S. Popov
http://ur4nww.qrz.ru/popov



The device operates as follows. A 4-5 V battery current is constantly circulating from terminal P to platinum plate A, then through the powder contained in the tube to another plate B and through the coil of the relay electromagnet back to the battery. The strength of this current is insufficient to attract the relay armature, but if the AB tube is exposed to electric oscillation, the resistance will instantly decrease and the current will increase so much that the relay armature will be pulled. At this moment, the circuit going from the battery to the bell interrupted at point C will close and the bell will begin to work, but immediately the shocked tube will again reduce its conductivity, and the relay will open the bell circuit. \\ <The invention of the radio by L. S. Popov>, USSR Academy of Sciences, 1945, p. 60. \\

Of the experiments cited by Popov to test the sensitivity of the receiver, the first two are especially important:
1) The device responds to electrophore discharges through a large audience if a wire about 1 meter long is drawn from point A or B parallel to the discharge direction, to increase the energy reaching the sawdust.
2) In conjunction with a vertical wire 2.5 meters long, the device responded in the open air to vibrations produced by a large hertz vibrator (square sheets of 40 centimeters aside) with a spark in oil, at a distance of 30 fathoms .



From the points that we highlighted by Popov's article, it is clear that in 1895 he received radio waves at a distance of 60 m from the receiving antenna of his receiver. In the same article, Popov describes the scope of his device in such a way: A *device with such a sensitivity can serve for various lecture experiments with electrical vibrations and, being closed by a metal case, can conveniently be adapted to experiments with electric rays ... Another application of the device, which can give more interesting results, will be its ability to detect electrical vibrations occurring in a conductor associated with point A or B (in the diagram), in the case when this conductor is exposed to electromagnetic perturbations occurring in the atmosphere. To do this, it is enough to connect the device, protected from all other actions, with an air wire laid far from telegraphs and telephones, or with a lightning rod rod* . Before us is a clear picture of a shielded receiver that registers the electromagnetic signals entering the receiving antenna. And the final conclusion of the author is quite natural:*In conclusion, I can express the hope that my device, with its further improvement, can be applied to transmitting signals over distances with the help of fast electrical vibrations, as soon as a source of such vibrations that has sufficient energy is found* .

Thus, A. S. Popov not only clearly represents the possibility of wireless telegraphy, but also indicates the way in which this task can be solved: obtaining powerful signal transmitters. On March 12 (24), 1896, A. S. Popov demonstrated the first broadcast in the world and the reception of meaningful text from one building to another at a distance of about 250 m. From the chemical audience of St. Petersburg University to the physical, where the meeting of the Physical Department of the Physicochemical Society was held , a radiogram was transmitted: <Heinrich Hertz>. Acad. V.F. Mitkevich recalls this historic day in this way: A *memorable meeting took place on Sunday afternoon in the large auditorium of the old physics laboratory in the courtyard of St. Petersburg University. In this modest ordinary audience, a radio station with a Morse apparatus was installed.*

At a distance of 250 m, in the new building of the University's chemical laboratory, there was a dispatch station, fed on a Rumkorf coil. Near her on duty was the closest assistant to A. S. Popov, P. N. Rybkin.

Among those present at the meeting were representatives of the Maritime Department and the most prominent Russian electrical physicists of that time: O. D. Khvolson, I. I. Borgman, A. I. Sadovsky, V. K. Lebedinsky, M. A. Shatelen, A. L Gershun, G. A. Lyuboslavsky, Y. N. Georgievsky, N. A. Smirnov, V. V. Skobeltsyn, N. A. Bulgakov, N. G. Egorov and F. F. Petrushevsky. Before the meeting, all the participants got acquainted with the device of the radio receiving station, and then, sitting on the student benches, prepared with excitement for the experience of transmitting a telegram without wires.

The meeting was opened by the oldest physicist F.F. Petrushevsky, giving the floor to A.S. Popov. After a 30-40-minute report, the inventor sent one of the youth present to the departure station to P.N. Rybkin with an order to start the radio broadcast.

The atmosphere in the physical laboratory has become tense. All those present knew that they were present at the demonstration of an invention, the future of which even then seemed to be the greatest. The excitement of the participants in the meeting was increased by the fact that the text of the world's first telegram was known only to Popov and Rybkin. Keeping outward calm, the inventor with a smile watched with what intense attention all those present watched the letters slowly appearing on the Morse receiver ribbon, which Petrushevsky repeated with chalk on a large classroom board .

The transfer process is described in more detail by O.D. Hvolson. *The transfer took place in such a way that the letters were transmitted in the Morse alphabet and, moreover, the signs were clearly audible. At the blackboard stood the chairman of the Physical Society prof. F.F. Petrushevsky, holding a paper with a key to the Morse alphabet and a piece of chalk. After each sign transmitted, he looked at the paper and then wrote the corresponding letter on the board. Gradually, the words Heinrich Hertz and, moreover, in Latin letters turned out on the board. It is difficult to describe the enthusiasm of the many present and a standing ovation to A. S. Popov when these two words were written*. So began his life one of the greatest inventions of human genius. The great inventor immortalized in the first radiogram the one who was the first in the world to observe electromagnetic waves. A. S. Popov was the first person to force these waves to serve man.

Popov was in the service of the Naval War Department and had instructions not to disclose his discovery. Therefore, the record of the historical day according to his direction was made in the minutes of society in this form: <A. S. Popov shows instruments for the lecture demonstration of Hertz's experiments. Their description has already been placed in the RFLFD> (RFLFR, 1896, vol. XXVIII, p. 124).

Literary sources:

A.I. Berg. M.I.Radovsky, "inventor of radio Popov," Gosekergoizdat, 1950, p. 70
History of Physics. Kudryavtsev P.S. - M :. Uchpedgiz. 1956, p. 234-235.

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